

CLAIMS

1. A computer readable media embodying a method for providing packet
2 data services, the method comprising:
 establishing a single Point-to-Point Protocol (PPP) layer for
4 communication between a mobile station and a wireless network;
 sending and receiving data through said single PPP layer using a first
6 Radio Link Protocol (RLP) layer characterized by a first grade of service; and
 sending and receiving data through said single PPP layer using a second
8 RLP layer characterized by a second grade of service, wherein the first grade of
service is different from the second grade of service.
2. The computer readable media of claim 1, the method further comprising:
2 establishing a first buffer having a first buffer size based on the first grade
of service; and
4 establishing a second buffer having a second buffer size based on the
second grade of service.
3. The computer readable media of claim 2, wherein the first buffer includes
2 retransmission and resequencing buffers, and the second buffer does not
include retransmission and resequencing buffers.
4. The computer readable media of claim 1, the method further comprising
2 establishing a single High-level Data Link Control (HDLC) layer, disposed
between said PPP layer and said first and second RLP layers.
5. The computer readable media of claim 4, the method further comprising:
2 establishing a first deframer layer, disposed between said HDLC layer
and said first RLP layer, for providing whole HDLC frames to said HDLC layer.
6. The computer readable media of claim 1, the method further comprising:
2 establishing a first High-level Data Link Control (HDLC) layer, disposed
between said PPP layer and said first RLP layer; and

4 establishing a second High-level Data Link Control (HDLC) layer,
disposed between said PPP layer and said second RLP layer.

7. A mobile station apparatus comprising a memory, wherein the memory
2 embodies a method for providing packet data services, the method comprising:
establishing a single Point-to-Point Protocol (PPP) layer for the mobile
4 station;

sending and receiving data through said single PPP layer using at least
6 two Radio Link Protocol (RLP) layers characterized by at least two different
grades of service.

8. The mobile station apparatus of claim 7 further comprising a wireless
2 modem for modulating RLP frames generated by the first and second RLP
layers.

9. The mobile station apparatus of claim 7 further comprising a CDMA
2 wireless modem for modulating RLP frames generated by the first and second
RLP layers.

10. The mobile station apparatus of claim 7 further comprising a control
2 processor for executing the method.

11. The mobile station apparatus of claim 7, wherein the different grades of
2 service include a reliable grade of service and a low latency grade of service.

12. The mobile station apparatus of claim 7, wherein said method further
2 comprises establishing a buffer for each of said at least two RLP layers, wherein
the size of each buffer is based on the grade of service of the corresponding
4 RLP layer.

13. The mobile station apparatus of claim 12, wherein each buffer includes
2 retransmission and resequencing buffers only if the corresponding RLP layer is
reliable.

14. The mobile station apparatus of claim 7, the method further comprising
2 establishing a single High-level Data Link Control (HDLC) layer, disposed
between said PPP layer and said at least two RLP layers.

15. A packet control function (PCF) apparatus comprising a memory,
2 wherein the memory embodies a method comprising:

establishing a first Radio Link Protocol (RLP) layer characterized by a
4 first grade of service;

establishing a second RLP layer characterized by a second grade of
6 service different from the first grade of service;

receiving data from a mobile station through the first RLP layer; and

8 receiving data from the mobile station through the second RLP layer.

16. The PCF apparatus of claim 15, wherein the method further comprises:

2 deframing data received through the first RLP layer to identify a first
High-level Data Link Control (HDLC) frame;

4 deframing data received through the second RLP layer to identify a
second HDLC frame;

6 providing the first HDLC frame to a Packet Data Serving Node (PDSN);

and

8 providing the second HDLC frame to the PDSN.

17. The PCF apparatus of claim 15, wherein the method further comprises:

2 providing data received through the first RLP layer to a first High-level
Data Link Control (HDLC) layer in a Packet Data Serving Node (PDSN); and

4 providing data received through the second RLP layer to a second HDLC
layer in the PDSN.

18. A wireless network apparatus comprising:

2 a Packet Control Function (PCF) for establishing a first Radio Link
Protocol (RLP) layer characterized by a first grade of service, establishing a
4 second RLP layer characterized by a second grade of service different from the
first grade of service, receiving data from a mobile station through the first RLP

6 layer, and receiving data from the mobile station through the second RLP layer;
and

8 a Packet Data Serving Node (PDSN) for extracting IP packets from data
received through the first and second RLP layers, and providing the IP packets
10 to an internet.

19. A wireless network apparatus comprising:

2 a Packet Data Serving Node (PDSN) for extracting IP packets from data
received through a single High-level Data Link Control (HDLC) layer associated
4 with a single Point-to-Point Protocol (PPP) connection to a mobile station; and
a Packet Control Function (PCF) for establishing a first Radio Link
6 Protocol (RLP) layer characterized by a first grade of service, establishing a
second RLP layer characterized by a second grade of service different from the
8 first grade of service, deframing data received through the first RLP layer to
identify a first HDLC frame, deframing data received through the second RLP
10 layer to identify a second HDLC frame, providing the first HDLC frame to the
single HDLC layer, and after providing the first HDLC frame to the single HDLC
12 layer, providing the second HDLC frame to the single HDLC layer.

20. A method for providing packet data services comprising:

2 establishing a single Point-to-Point Protocol (PPP) layer for
communication between a mobile station and a wireless network;
4 sending and receiving data through said single PPP layer using at least
two Radio Link Protocol (RLP) layers characterized by at least two different
6 grades of service.

21. The method of claim 20, the method further comprising establishing a
2 buffer for each of said at least two RLP layers, wherein the size of each buffer is
based on the grade of service of the corresponding RLP layer.

22. The method of claim 20, further comprising establishing a single High-
2 level Data Link Control (HDLC) layer, disposed between said PPP layer and
said at least two RLP layers.

23. The method of claim 20, further comprising establishing a first deframer
2 layer, disposed between said HDLC layer and said first RLP layer, for providing
whole HDLC frames to said HDLC layer.

24. The method of claim 20, further comprising establishing at least two
2 High-level Data Link Control (HDLC) layers, wherein one HDLC layer is
disposed between said PPP layer and each of said at least two RLP layers.

25. A method for providing packet data services comprising:
2 at a mobile station, establishing a single Point-to-Point Protocol (PPP)
layer for communication between a mobile station and a wireless network;
4 at the mobile station, using the single PPP layer to encapsulate an IP
packet associated with a delay-sensitive application to generate a first PPP
6 packet;
at the mobile station, using the single PPP layer to encapsulate an IP
8 packet associated with a non-delay-sensitive application to generate a second
PPP packet;
10 at the mobile station, sending the first PPP packet through a low latency
Radio Link Protocol (RLP) layer to the wireless network; and
12 at the mobile station, sending the second PPP packet through a reliable
RLP layer to the wireless network.

26. The method of claim 25 further comprising:
2 at the mobile station, converting the first PPP packet into a first High-
level Data Link Control (HDLC) frame using an HDLC layer in the mobile station
4 prior to sending the first PPP packet; and
at the mobile station, converting the second PPP packet into a second
6 HDLC frame using the HDLC layer in the mobile station prior to sending the
second PPP packet.

27. A method for providing packet data services comprising:
2 in a packet control function (PCF), receiving a first set of data bytes from
a mobile station through a low latency Radio Link Protocol (RLP) layer;

- 4 in the PCF, receiving a second set of data bytes from the mobile station
through a reliable RLP layer;
- 6 providing the first set of data bytes to a Packet Data Serving Node
(PDSN) through a Point-to-Point Protocol (PPP) connection with the PDSN; and
- 8 providing the second set of data bytes to the PDSN through the PPP
connection.

28. The method of claim 27 further comprising:

- 2 prior to providing the first set of data bytes to the PPP layer, using one or
more High-level Data Link Control (HDLC) flag characters within the first set of
- 4 data bytes to identify a third set of data bytes within the first set of data bytes
corresponding to at least one complete HDLC frame; and
- 6 providing the third set of data bytes consecutively to the PDSN through
the PPP connection.

29. The method of claim 27 further comprising:

- 2 prior to providing the first set of data bytes to the PPP layer, using one or
more High-level Data Link Control (HDLC) flag characters within the second set
- 4 of data bytes to identify a third set of data bytes within the second set of data
bytes corresponding to at least one complete HDLC frame; and
- 6 providing the third set of data bytes consecutively to the PDSN through
the PPP connection.

30. The method of claim 27 further comprising:

- providing the first set of data bytes to the PPP layer through a first High-
level Data Link Control (HDLC) connection with the PDSN; and
- providing the second data bytes to the PPP layer through a second
HDLC connection with the PDSN.